RAILWAY ENGINEERING
and Maintenance of Way

Published by the
BRUCE V. CRANDALL COMPANY, CHICAGO

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Telephone - - Main 3185.

Eastern Office: Room 714, 132 Nassau Street, New York City
Telephone - - 3524 John.

A Monthly Railway Journal

Devoted to the interests of railway engineering, maintenance of way, bridges and buildings.

Communications on any topic suitable to our columns are solicited.

Subscription price, $1.00 a year; to foreign countries, $1.50, free of postage. Single copies, 10 cents. Advertising rates given on application to the office, by mail or in person.

In remitting make all checks payable to the Bruce V. Crandall Company.

Papers should reach subscribers by the tenth of the month at the latest. Kindly notify us at once of any delay or failure to receive any issue and another copy will be very gladly sent.

Entered as Second-Class Matter April 13, 1905, at the Post Office at Chicago, Illinois, Under the Act of Congress of March 3, 1879.

VOL. II CHICAGO, MARCH, 1906 NO. 3

The New Washington Station.

THAT is to be the greatest railway station in the world when completed, is the monster terminal under construction at the nation's capitol. The earthwork on this immense work was begun in December, 1903, and has been an undertaking of no mean magnitude, as will be understood when it is stated that the grade of the station is thirty-five feet higher than the surrounding levels, to provide for which, concrete piers of that height are in, on which the structure will be carried.

Everything connected with this enterprise is on the most gigantic scale. The structure looks upon a plaza 500 feet wide by 1,000 feet long, which makes a fitting and harmonious setting for the architectural achievements that will round out the grandest railway station scheme yet attempted. The station itself is 620 feet long, at the rear of which is the concourse of a length of 760 feet and width of 130 feet. The immense dimensions are continued in the general waiting room which is to have a length of 220 feet, a width of 130 feet, and a height of 90 feet. The dining room is to be 35 feet high, 80 feet wide and 100 feet long, while the ticket lobby has the same dimensions except a width of 50 feet.

The trackage will consist of twenty stubs on the waiting room level, while thirteen tracks are depressed twenty feet below street level, seven of the latter passing under the building for through traffic, making a total of thirty-three tracks. In conformity with the present tendency to discard the old form of construction of train sheds, the umbrella type of passenger protection will be used over each platform. The material for the exterior is to be of white Vermont granite, and total estimate cost of the project is $14,000,000.

Subway Problems.

RENEWED interest in subway construction and the causes of discomfort to the patrons, is awakened periodically by suggestions from those in a position to know whereof they speak. At the February meeting of the New England Railroad Club, Mr. Geo. Rice, member of the New York Rapid Transit Commission, touched upon some points which in his opinion would improve the construction of future subways. Among the matters requiring attention, is the elimination of the steel columns which are now located between the track, and the substitution of concrete walls therefor. Concrete was also thought by the commission to be superior to ties and ballast for a road bed.

With reference to ventilation the speaker took the ground that the heat was responsible for the unpleasant odors, giving the rise in temperature due to friction of the brake shoes, at about 14 degrees, for which the escape of electricity was partly responsible—smells in the subway had been relieved by the use of higher grade lubricating oils. There are those who will take issue with the gentleman on two counts, that which refers to the concrete bed for the track, and that referring to ventilation. Concrete has been found quite too rigid for track support wherever it has been used. Rupture has invariably occurred, either to the rail or concrete, that is, when the latter was in the form of a tie. What the performance would be in the form of a longitudinal support under the rail is open to conjecture. As to the ventilation, it has been found in subway and tunnel practice abroad, that the only relief from foul atmosphere was obtained by the use of exhaust fans. It is a mistake to assume that the quality of oil used has ameliorated the smell situation in the New York Subway—as all will testify who are obliged to use the bore.

Electric Power on the New York, New Haven & Hartford.

THE details of the electrification of the New York, New Haven & Hartford Railroad, which have recently been given full publicity, show that electric power transmission is not hedged about by any standard. The means for reaching results by this wonderful agency present a wider field than by any other known means. The single phase transmission will be used on the main line over a district twenty-two miles long, and is expected to ultimately cover sixty miles, without a

sub-station or feeder. In this respect, the installation is unique, as remaining in strict consonance with simple direct current traditions, but at a higher potential than is usual on trolley wires—11,000 volts.

In the design of the supports for the overhead work to carry this power, there are bridges over the tracks at intervals of 300 feet, which are to be used in the dual capacity of wire supports and also carry the block signal system, both of which will always be visible to the tower operator. It is apparent that this combination is an original one and should be conducive to efficient operation as when separated, as in the pole form of transmission. This plan has the advantage of a reasonable cost figure in any event ($26,600 per mile), and is certainly an improvement over ordinary trolley practice, as it has been demonstrated that no side feeders are necessary for increasing the conductivity when No. 0000 trolley wires are used, and also that distribution losses are lower than five per cent.

Some comment has been stirred up in electrical circles over the fact that the motors of this line are to be operated partly on the New York Central, into the Grand Central station, which is operated by the direct current system. There are really no serious complications involved in the adaptation of these locomotives to service on either line. They are gearless, having a double truck with quadruple equipment. The four motors will be controlled by the auto-transformer tap system on the alternating current section, and by the electro-pneumatic two-motor series-parallel scheme on the direct current district. The whole arrangement indicates much original thought in conception.

The Railroad Tie.

THE growing scarcity of material for wooden ties, the world over, has given cause for disquietude to all concerned in maintenance of way, and has forced inquiry in other channels for a substitute, that will at least give as good service as wood, at a cost not prohibitive. It is understood that while the average cost of a wooden tie remains constant at present at about 50 cents, time is not far away when they cannot be obtained at any price, even though attempts are being made to foster tree planting for the exclusive purpose of furnishing ties, and it is the cost of the substitutes for wood that makes the question a most vital one to railroads, since nothing has as yet been developed that can be put in the track for much less than four times the cost of wood.

Reinforced concrete has been looked to as one of the agents by which it is expected that relief may be had from this difficulty, since the strength is ample for any load it is designed for, but the endurance of the concrete tie is thus far an uncertain quantity, as deduced from their performance in this country, they being unable to resist the shocks set up by the engine and train, and particularly the disturbance due to the unbalanced reciprocating parts of the engine and the consequent blow on the rail, which has caused disintegration of the concrete in many cases. Research is still going on with the hope of overcoming the trouble that threatens to make hopeless, relief from that quarter.

Experiments were made in France, Italy and Germany about five years ago to demonstrate what there might be in the concrete tie, and with such satisfactory results, that in 1903 there were several hundred of them installed in France in order to get service results. These ties were formed of steel plates placed edge up, around which was cast the concrete, making a tie about four inches thick. They were laid at about 30 inches centers, and designed for a wheel load of about 15,000 lbs. Their service up to the present has been one to give hope of a solution of the tie problem for that road, the service test giving no signs of disintegration of the concrete. These ties cost nearly $3.00 each.

The fact that they were able to resist the destructive effects of traffic implies a liberal amount of metal, and therefore the high price estimating the cost of such a tie that would give a like resistance to the wheel loads of 30,000 lbs., which are not uncommon on our heavy power, it is more than likely that such a design of tie would be too costly for consideration, based on initial cost figures, but would have a different complexion if spread over a long term of service, in which no renewals were required. Since the cost per mile of the concrete tie would be six times that of the wooden article, the former would be required to give a service six times that of the wood in order to even up this cost. If it cannot do this and relieve the present drain on the timber supply, there is scant prospect for the adoption of the concrete tie.

Attention is again directed to the steel tie by numerous designs being presented which have points of superiority over anything of the kind yet gotten up. The cost question has been carefully weighed, as has also the matter of elasticity, want of which has been the principal factor in the destruction of both concrete and steel ties, and it is to steel that many engineers now look for the ideal tie. That rigidity was regarded as a destructive element in the case of the French concrete ties noted above, was evidenced by their use of a compressed felt strip at the rail crossing of each tie. In the case of these steel ties recently developed the problem has been approached on strictly engineering lines by equating resisting moments to binding moments due to wheel loads, and providing for known stresses by logical processes, obtaining a value of elasticity that is certain to insure the life of both rail and tie. There is no doubt about the durability of the steel tie as compared with others, and it is believed that such a tie can now be placed under rails at a figure that will make the wooden tie an undesirable article to use. Further particulars as to design, manufacture and cost of this tie will appear in a future issue of Railway Engineering.

Hoboken Signal Tower—Delaware, Lackawanna & Western R. R.

A CONSTRUCTION of more than ordinary interest to those concerned with terminal signaling, is the new signal tower at Hoboken, N. J., for the reason that it embodies some advanced thought in that line of work, not only with the view of placing the best facilities in the hands of the operator to enable him to give a service that means safety to the trains he guides to and from the terminal, but the structure itself is one that will attract the attention of engineers because of the original features in its design.

The tower, which is 18x36 feet, rests on staggered piles, the tops of the piles being 8 feet 6 inches below ground level. The walls from the top of the foundation to the underside of the first story window sills, and all corner and intermediate piers, also the piers in basement, are built of hard common brick. The corner and intermediate piers extend from the top of the concrete foundation walls to the under side of roof, interrupted at the floors by concrete girders. Where exterior surfaces of brick walls in the first story are exposed to view, they are faced with dark red or maroon colored vitrified paving brick. The window sills are of blue stone projecting 1½ inches beyond the face of brick work.

Exterior finish of walls above the first story window sills is of expanded metal and cement plaster, rough

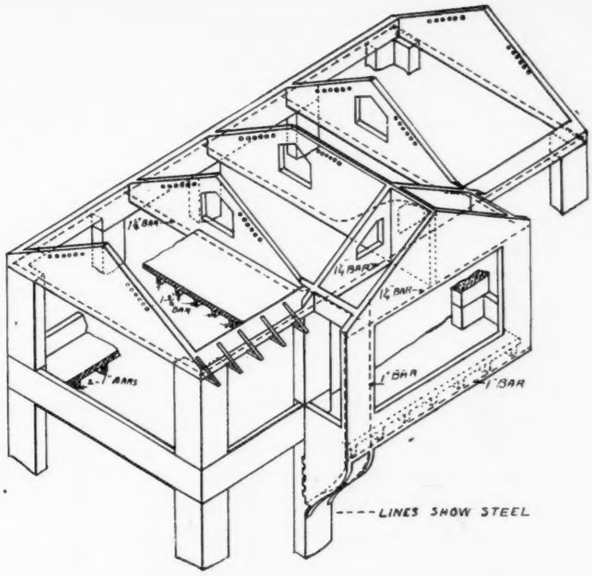


FIG. 1.—ISOMETRIC VIEW OF CONCRETE ROOF CONSTRUCTION HOBOKEN SIGNAL TOWER

cast. The interior walls are wainscoted to a height of five feet above the floor line, with crimped metal. The flooring is double, the under course being of ⅞x8 1-3 inch hemlock and the upper course of ⅞x2¼ inch maple, with two thicknesses of Neponset red building paper between. All wood floors are laid on chestnut sleepers.

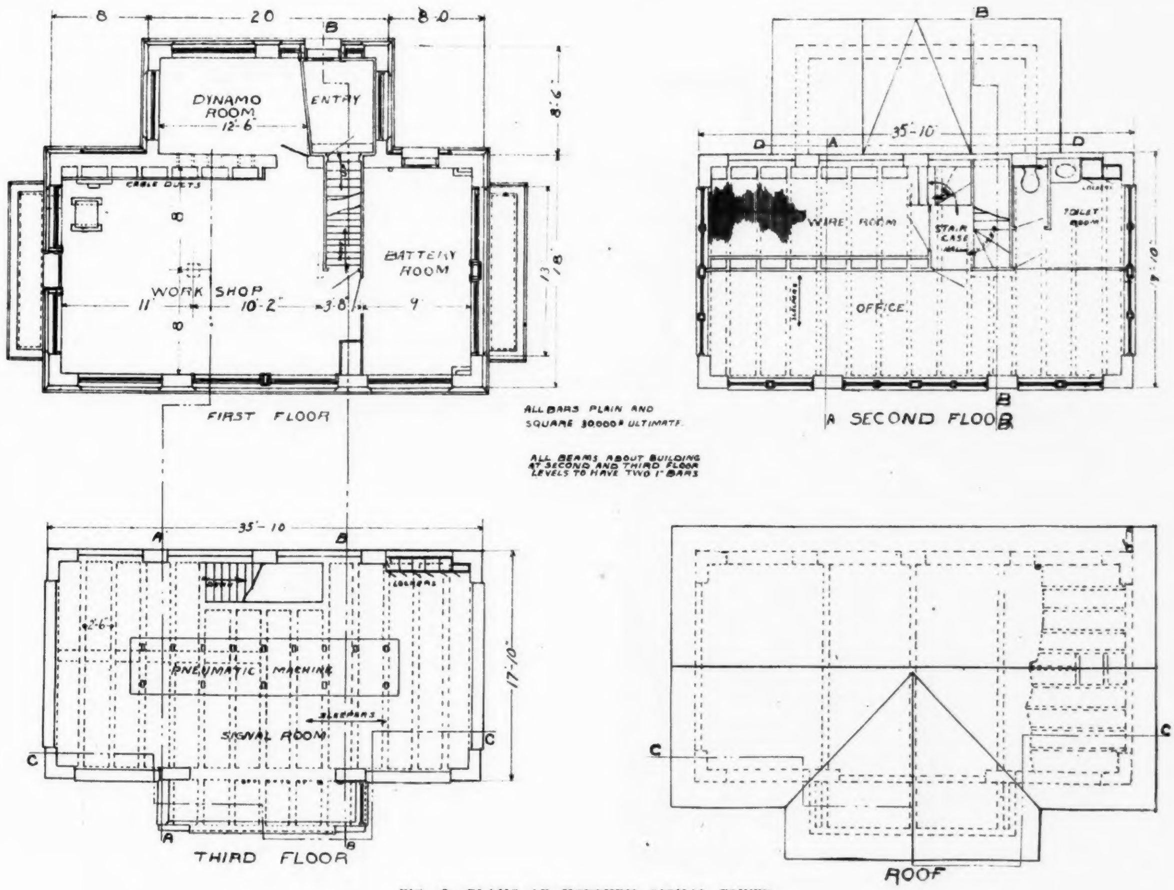


FIG. 2—PLANS OF HOBOKEN SIGNAL TOWER

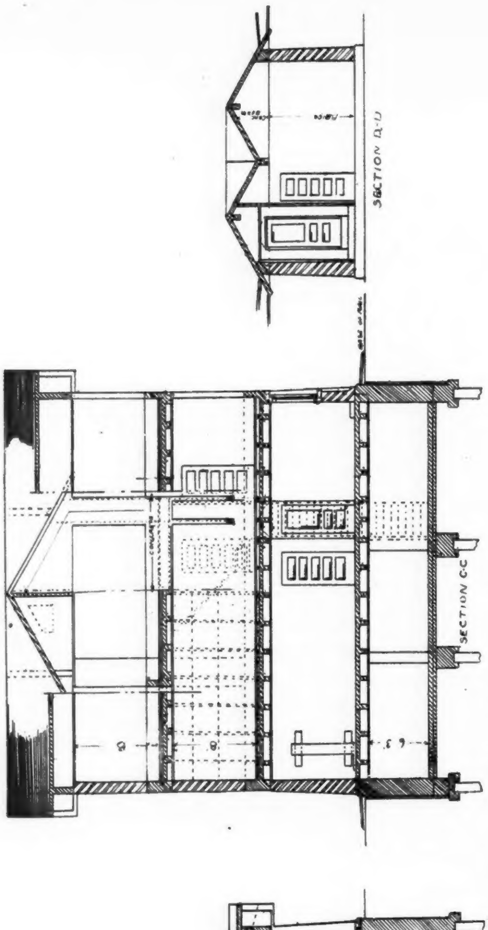


FIG. 3—SECTIONS OF HOBOKEN SIGNAL TOWER

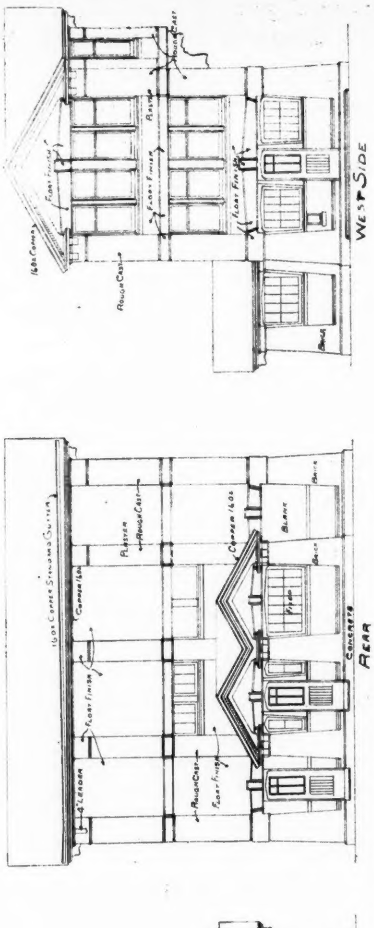


FIG. 4—ELEVATIONS OF HOBOKEN SIGNAL TOWER

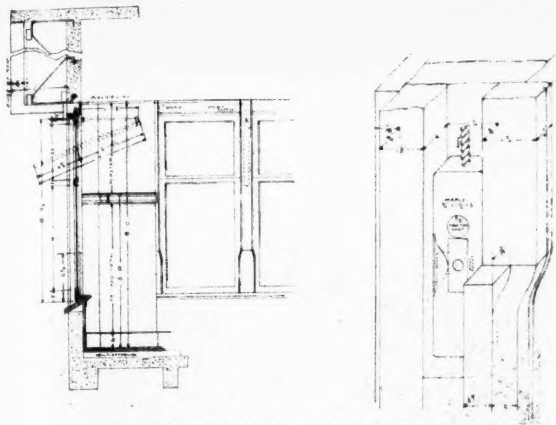


FIG. 5—WINDOW DETAILS, HOBOKEN SIGNAL TOWER

The trimming in the office on the second floor, and also on the third floor, is of white wood with mahogany stain.

The windows have some specially excellent features that commend themselves for tower purposes, those for the second and third floors being hinged at one-third of their length from the top, the short end passing to the inside, and the long end folding upward, when necessary. It is a novel construction and one well calculated to furnish plenty of ventilation and also gives an unobstructed view when occasion requires, being of a combined sliding and pivot arrangement with trunk rollers.

The entire roof is of cinder concrete covered with "Actinolite" roofing, while floor beams, girders, brackets, wall slabs and floor slabs, are of concrete in the proportion of one part of Portland cement of brand to be selected by the Chief Engineer, two parts of clean, sharp washed sand, and five parts of crushed stone, no piece of which shall be larger than will pass through a ¾ inch ring, and none smaller than will pass through a ½ inch ring. This concrete is reinforced with plain square rods. There is no plastering on the walls of the work shop, dynamo room or battery room on the first floor. The walls above wainscoting in the second and third stories, also the ceiling of basement, first, second and third stories are lathed with expanded metal lath, secured to ceilings with wires, and secured to walls with double-pointed tacks. Solid plaster partitions are constructed of ¾ inch channels set 12 inch centers, and lathed with expanded metal.

The reinforcement consists of T-rails at the ground line, and one-inch bars at the walls and floor girders, making, with the brick substructure, a composite design that while unique in architecture (being the only one of the kind ever built), is of a most substantial character and as near fire-proof as the present state of the art is capable of. It is the third largest signal tower in this country, and will be equipped with 131 levers of the Union Switch & Signal Co.'s Electro Pneumatic system.

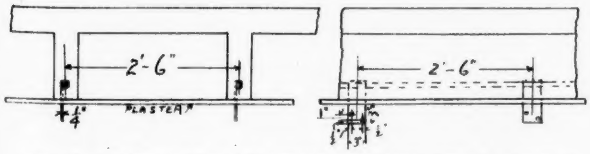


FIG. 6—LOCATION OF PLACE STRAPS, HOBOKEN SIGNAL TOWER

Concrete engineering as applied to railway constructive details can be seen at its best on the Lackawanna, and this last achievement in structural work is a fitting one with which to close a year of remarkable improvements in that direction. We are indebted to Chief Engineer Lincoln Bush, and Architect Frank J. Nies, for courtesies extended in the way of prints and data.

Mexican Railway Location.

By Walter Gardner, C. E., City of Mexico.

THE railroad builder in Mexico finds himself confronted at the outset with conditions radically different from those obtaining in the United States. Chief among these are the climatic conditions and the character of the soil. The country is mountainous and consequently the climatic conditions are constantly varying with the change in elevatons.

The City of Mexico is the commercial and financial center of the Republic as well as its capital, hence the city has become the railway center as well. The Republic is shaped like a cornucopia with the large end to the north. A range of mountains runs along the eastern third and a similar range on the western third. These ranges come together south and east of Mexico City, and a short distance north of the City of Oaxaca.

In the northern half of the Republic lies what is known as the plateau country with an average elevation of 6000 feet above sea level. The soil of this plateau is loose and friable, and during the rainy season a great deal of trouble is experienced with the fills.

The country is seamed with arroyas or small creeks or branches which are as dry as the inside of a powder horn during nine months of the year, but for the remaining three, during the rainy season in summer, have

FIG. 1—LAKE TOCHIMILCO, SHOWING HOW BANK SLOUGHS OFF DURING RAINY SEASON

FIG. 2—CROSSING LAKE CHALCO. THIS LAKE HAS BEEN DRAINED AND IS NOW USED FOR GROWING CORN. LONG SLOPES OF EMBANKMENT SHOW EFFECT OF RAINY SEASON.

FIG. 3—TRACK THROUGH HACIENDA MIRAFLORES, 30 MILES FROM MEXICO CITY, SHOWING DRAINAGE IN SHALLOW CUTS. BALLAST IS TEZONTLE, A VOLCANIC STONE RESEMBLING COAL CINDERS.

more or less water in them. It frequently happens that an unusually heavy shower in the mountains will, in two hours or less, have these arroyas bank full, and the torrent comes down with almost irresistible force, sweeping away all obstructions and frequently taking out embankments as though they were built of sand.

No allowance on the part of the engineer can insure sufficient clearance in culverts, trestles or bridges to guard against these sudden floods. The loose friable nature of the soil renders the protection of the banks at openings, even though shielded by heavy wing dams and rip rap, a very difficult problem.

The valley of Mexico lies between the two ranges of mountains above referred to, with an average elevation of 7500 feet above sea level, this valley being bowl shaped and surrounded by spur ranges from the main chains, and the problem of getting into and out of this valley is one calculated to test the ability of the locating engineer. The Mexican National's Toluca line crosses the range, rising to an elevation of 11,000 feet at Salazar and the Mexican Central's Cuernavaca division crosses the Ajusco range at an elevation of 10,000 feet. The San Rafael & Atlixco gets out of the valley to the east by climbing the spurs of Popocatepetl, its highest elevation being 9000 feet at El Fraile.

The soil in the valley of Mexico is alluvial. Lakes formerly occupied the greater portion of the valley and water can be found almost anywhere at a depth of three to six feet. During the rainy season, the embankments become very soft and it has required years of work and a surprising amount of ballast to get the tracks up out of the mud and keep them up.

Taking the City of Mexico as a starting point the engineer running a line to either coast is confronted

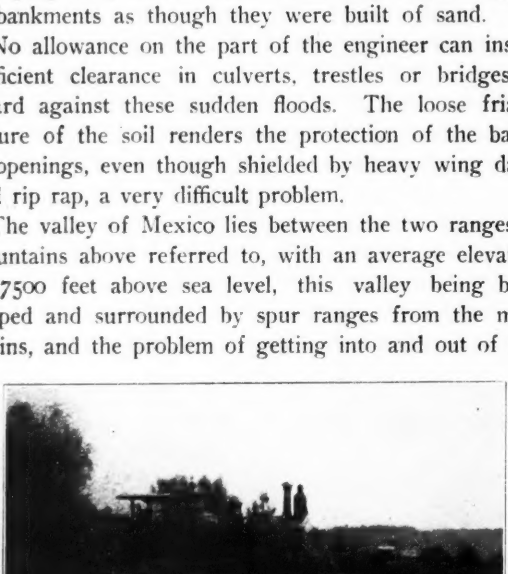


FIG. 4—ARCH CULVERT WITH WING DAM CROSSING ARROYO OF LIVING WATER.

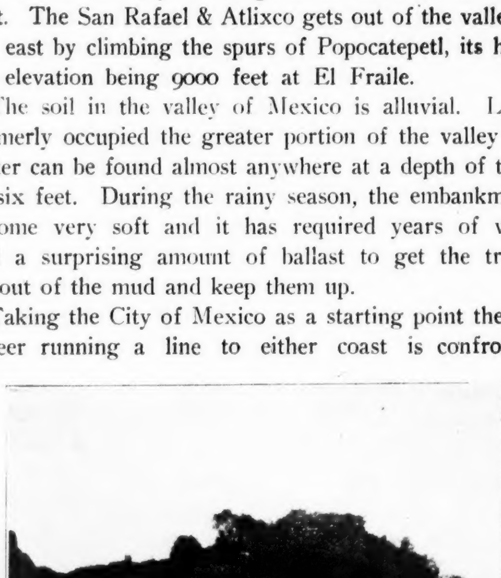


FIG. 5—VERTICAL CUT IN TEPATATE SPURS OF POPOCATEPETL.

FIG. 6—CUT ON SPURS OF POPOCATEPETL SHOWING CROSSING OF DEEP BARRANCA OR RAVINE

FIG. 7—CUT ON SPURS OF POPOCATEPETL SHOWING DRAINAGE DITCHES AND EFFECT OF RAINS ON ROADBED.

first, with the task of getting a practical line out of the valley, and this can only be done by maximum grades of 3 to 4 per cent and curvature of 120 to 150. After crossing the range and reaching the plateau country he is obliged to catch the head of a stream and follow that, frequently finding that the valley is exceedingly tortuous, requiring his maximum curvature, while mountain spurs also intervene through which he must tunnel.

After finally locating an acceptable line to within 100 miles of the coast he is confronted by an abrupt falling away of the land and is compelled to locate a line, often in a distance of only ten or twelve miles where his levels drop from 6000 to 7000 feet to 200 or 300 feet above sea level. He is fortunate, indeed if he can find a box canyon where he can lay his line alongside the wall, but it almost invariably happens that he finds lateral canyons or barrancas opening out from the main canyon, which are too narrow to permit of swinging his line up its course, and he is obliged to cross with a viaduct 50 to 100 feet or even higher, with a reverse curve of 120 to 150 and on a maximum grade of 3 to 4 per cent.

During the rainy season so abrupt are these canyons, the water comes down with immense force, the flow having all the impetus of a water fall, and the flood occupies the full width of the canyon; in some places where it is very narrow the water rising to a height of 60 to 75 feet above the floor of the gorge.

A preliminary survey of a line in the state of Oaxaca, from the engineer's report of which the following extract is taken, will serve to illustrate some of the obstacles to be overcome by the locating engineer, who is too frequently required to build such a line without sufficient appropriation, the construction company expecting the railway company to expend on betterments of the completed line, the amount necessary to bring it up to a condition suitable for economical and safe operation. The report referred to says:

"Kilometers 68 to 69—1 kilometer, Bocarou of the San Marcos. The San Marcos canyon is very narrow and comparatively straight, with perpendicular walls rising about 115 meters (374 feet); the width of the canyon between the walls is 11 meters (36.0899 feet). The water fills the entire channel and in flood season rises to a great height, approximately 20 meters (65.618 feet). The channel is so narrow and the walls so nearly perpendicular that the road must be partly in tunnel, partly in gallery and partly supported by longitudinal bridging. The entire length of this extremely difficult canyon is 300 meters (984.2697 feet.)"

After the line is built the troubles of the maintenance of way engineer begins. In the plateau country during the rainy season he finds his banks giving way or being entirely washed out in unexpected places. In the descent from the plateau to the coast country, he must be prepared for unexpected rushes of water and not infrequently finds the side of a mountain giving way and roadbed and track carefully deposited at the bottom of the gorge.

Then the line in the hoplands presents entirely differend conditions. The soil is little if any better calculated to resist rainfall, in many places absorbing water like a sponge. The tropical undergrowth is very dense and springs up quickly after having been cleared, and the newly laid track heaves by reason of the putting forth of new shoots from the roots of the weeds, brush and trees that have been cut away. It requires from three to five years to exterminate this growth, and in the meantime the maintenance of way man is damned by every one connected with the operating department. This has been the principal reason why the Vera Cruz & Pacific, though in operation for four years, has only recently been brought up so that Pullman cars could be operated.

For many years the Tehuantepec National, from Coatzacoalcos to Salina Cruz, across the Isthmus of Tehaunte-

pec, has been contending with these conditions and a vast amount of labor and money have been expended in bringing the road up to an operating condition. The Cuernavaca division, for the same reason, is just beginning to show satisfactory returns from operation.

The railroad builder entering the Mexican fields finds it is a condition, not a theory, which confronts him, and that all his experience in the United States goes practically for naught. He finds the physical condition of the country, the class of labor, the requirements of traffic and the location of prominent points on his line are entirely different from anything that he may have previously encountered in his experience in the United States and he finds himself under the necessity of, to all intents and purposes, learning the business over again. The fact that a man has been successful in construction and operation in the United States does not necessarily imply that he will be so in Mexico.

*Rail Joints.**

FOR the better understanding of this all-absorbing subject, permit us to review the development of the rail joint, going back to the days of the cast and rolled-iron chair. While many of us remember the chair joint as an old friend and did at a time think kindly of it, we did, however, arrive at the point of wanting something better. Its defects consisted principally of the difficulty of holding the rails in line, and to the same plane; means for taking care of contraction and expansion depending on slots in the rail base. This joint was used both suspended and supported.

The plain splice or fish plate succeeded the rail chair, and corrected many of the defects of the chair excepting that of slotting the base of rail. As traffic increased, however, the time soon came for a stronger bar, laterally as well as vertically.

The angle bar joint in turn succeeded the fish plate, which meant the adding of a base member to the latter, and for a time was considered to have largely solved the problem since it corrected the defects heretofore existing in previous joints. The joint in this shape has been longer in use than any other form, and is generally in use at the present time, but within the last few years it has been the weakest part in the superstructure of a railroad, and has been a source of great expense in maintenance.

Up to this time the relation of adequacy had been between the load and the splice rather than between the load and the rail. The rapid increase of traffic and wheel loads demanded heavier rails and stronger joints. The girder depth of the latter being confined between certain limits, the top of the tie, and under head of rail, consequently fell far short of doing equal work with the increase of rail section. Many were the schemes adopted to supplement the joint, prominent among which was angle bars varying in length from 18 to 48 inches long, four and six bolt joints, being designed for supported, suspended and three tie joints. The most satisfactory angle bar, and the one giving the best results, is 36 inches long, slotted for spike at each end, but not in the center, six bolts, supported joint. A rail joint is in fact a splice strong enough for the purpose of uniting the rails so that the load can be transmitted from one rail to the other and the rail transmit this load to the sub-grade through the ties and the ballast.

Supported joint;—on account of the break in the continuity of the rail at the joint, each wheel as it passes exerts a hammer blow, which impact increases the static load enormously, depending on the opening between the rails and the strength of the splicing structure, resulting in excessive deflection of the rail ends. This deflection the joint tie receives direct, and, consequently is soon pounded out of surface, when thus low, it gives a too long suspended joint.

The suspended joint has been largely adopted throughout this country. The reason for its adoption was largely that the deflection of the rail ends is in space and the load is distributed directly to the adjoining ties, whereas, in the former case, it was directly borne by the center tie so long as it was in a position to receive it.

The angle bar having a base plate, either separate or integral, has, to a large extent, superceded the ordinary angle bar joint, its design seeking to give greater strength. The detached base support, however, proved defective, mainly for the reason that as soon as one of the joint ties became loose the base plate dropped just at the time when its assistance was most needed. The integral base plate corrects this defect perfectly. There are several well-known designs of this class of joint, all of which are quite an improvement over the ordinary angle bar. These joints increase the carrying capacity over the angle bar, though to a limited extent.

During the last ten years, the traffic conditions and wheel loads, particularly on the Eastern trunk lines, has become so great that what is known as the girder form of joint has been extensively used. The traffic conditions on these roads have become such that frequent broken splice are found. The joints that have met these conditions successfully are what is known as the girder form of joint. There are several different makes of gider joints in use, varying in detail only. The cross section of this form of joint can be proportioned to meet conditions.

Girder joints having a positive base support have not proven a success, being too rigid under the rail ends, and the support acting as an anvil, causing damage to rail ends by either battering or splitting.

The girder joints in successful service have free dependent flanges, the proper form, however, of these flanges seems to be yet undecided, as there is quite a variance in the different designs, some giving more or less resiliency. Extensive tests in track have been

*Read before the Roadmasters' and Maintenance of Way Association at the twenty-third annual convention, Niagara Falls, N. Y., Sept. 12-14, 1905.

made to demonstrate what proportion of strength the joint should bear to the rail it unites, and the opinion seems to prevail that it should closely approach that of an unbroken rail.

The conclusions derived from the foregoing governing the requirements of a rail joint for the heaviest conditions as follows:

1st. Joint should be as simple, and consist of as few parts as possible.

2nd. Joint should be suspended.

3rd. It must connect the rails into a uniform continuous girder of sufficient depth to give a carrying capacity equal to or little less than the unbroken rail.

4th. It must be strong enough to resist deformation or taking permanent set.

5th. It must prevent deflection, or vertical movement of ends of rails, and permit movement lengthwise for expansion.

6th. Section of joint to be such as to give resiliency so that the load wave of the rail will be practically the same through the joint as along the unbroken rail.

7th. Joint to be 36 in. long.

8th. Joint to have 4 bolts, and for heavy sections of rails to be not less than ⅞ in. or 1 in. in diameter, preferably the latter.

9th. Hexagon nuts to be used to give all the room possible for strengthening the middle member of bar.

10th. Springs to be used between the nuts and bars for the purpose of taking up slack due to the better fitting of the parts, also a positive nut-locking device.

Timothy Hickey, Chairman,
Henry Ferguson,
J. B. Dickson,
J. F. Demling,
S. B. Rice,
Committee.

Railway Course in New York University.

Dean Johnson, of the School of Commerce of New York University, announces the establishment of a group of railroad courses for young men employed in the railroad offices in New York City, in which they may obtain instruction in the evening, from experts in various departments. The circular covering the courses says: "They will be conducted as far as practicable, by experienced railroad men and will deal with concrete facts and conditions. It is expected that the work will add directly to the efficiency of men engaged in any department of railroad service."

The courses are as follows: Railroad Accounting, conducted by M. P. Blauvelt, Comptroller of the Erie R. R. Co., and C. E. Fosdick, of Haskins & Sells; Legal Problems of Railroad Operation, conducted by Rokert Walker, assistant to General Consul C., R. I. & P. Ry.; Principles of American Rate Making, conducted by W. H. Lough, Jr.; Railroad Finance, conducted by T. W. Mitchell, Ph. D.; Industrial Geography, conducted by W. C. Webster, Ph. D.

Hoboken Terminal Train Sheds, Delaware, Lackawanna & Western R. R.

THE new terminal of the D., L. & W. R. R., now under construction at Hoboken, N. J., will possess some features of design and arrangement for handling passenger traffic, radically different in many particulars from any other conception for the purpose ever built. The present well defined disposition of railroads to get away from the old cumbersome and expensive type of terminal station of barn-like proportions, has materialized in this case, in an original and attractive engineering proposition in which Chief Engineer Bush. by whose courtesy we are enabled to present these illustra-

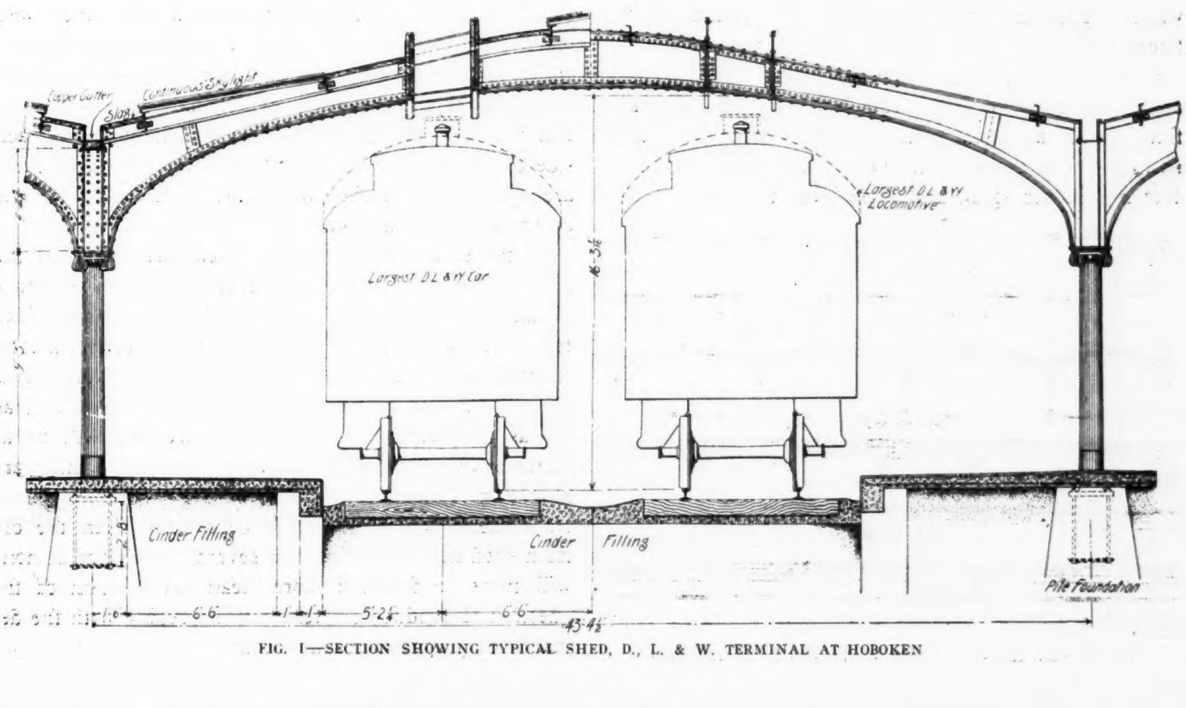


FIG. 1—SECTION SHOWING TYPICAL SHED, D., L. & W. TERMINAL AT HOBOKEN

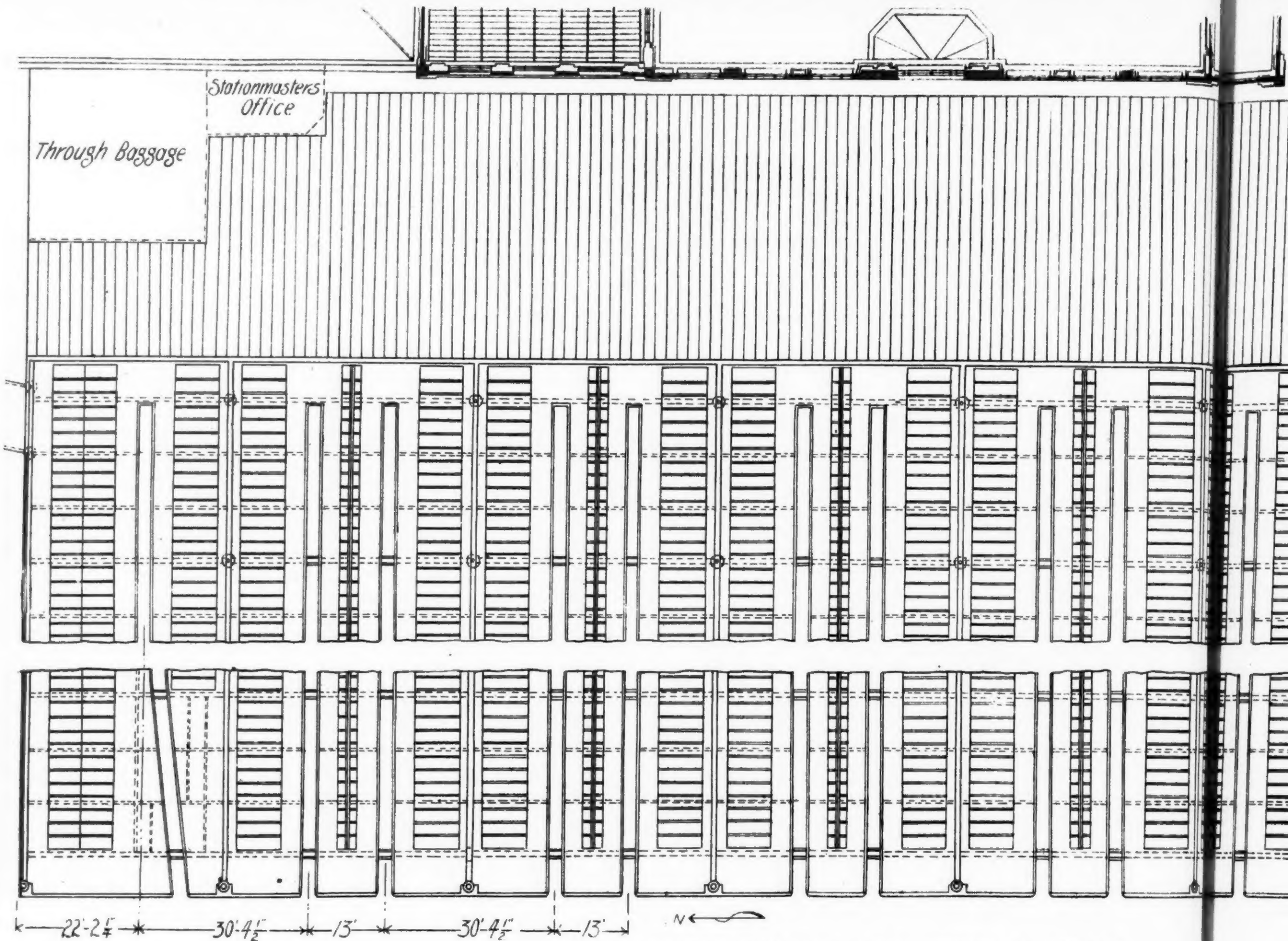


FIG. 2—PARTIAL PLAN OF D., L. & W. TERMINAL AT HOBOKEN

tions, has again shown his ability to adapt means to ends, on lines purely his own.

These sheds will cover fourteen tracks, and the posts which support the roof will rest on pile foundations between which is a cinder filling covered with reinforced concrete which constitute the platforms. The columns supporting the roof are of cast iron one inch thick, and fluted, with an ornamental cap from which the arch springs. The arches over the double tracks are of 43 feet 4½ inches span, and those over the single tracks are 35 feet 10½ inches and 30 feet 4½ inches span, respectively. The arch girders are of the built-up style, the bottom flanges of which are made of two angles, 4x4x7-16 inches, between which is a ½x9 inch web plate, on which rests an 8-inch 2.18 pound deck beam, which in turn is covered with slag roofing except where occur the skylight openings which have an opening 11 feet 6 inches and are continuous longitudinally at each side of the tracks. Over the center line of tracks there are openings 30 inches wide, also continuous, for the escape of smoke and gases.

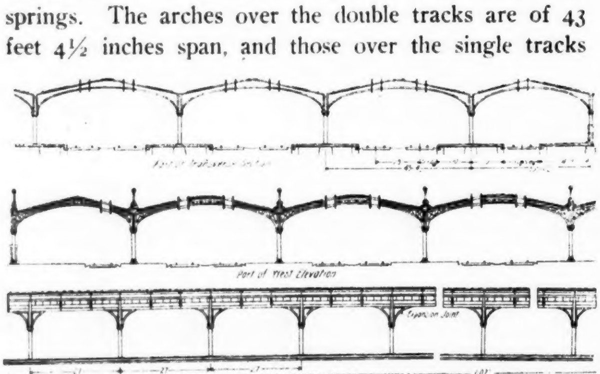
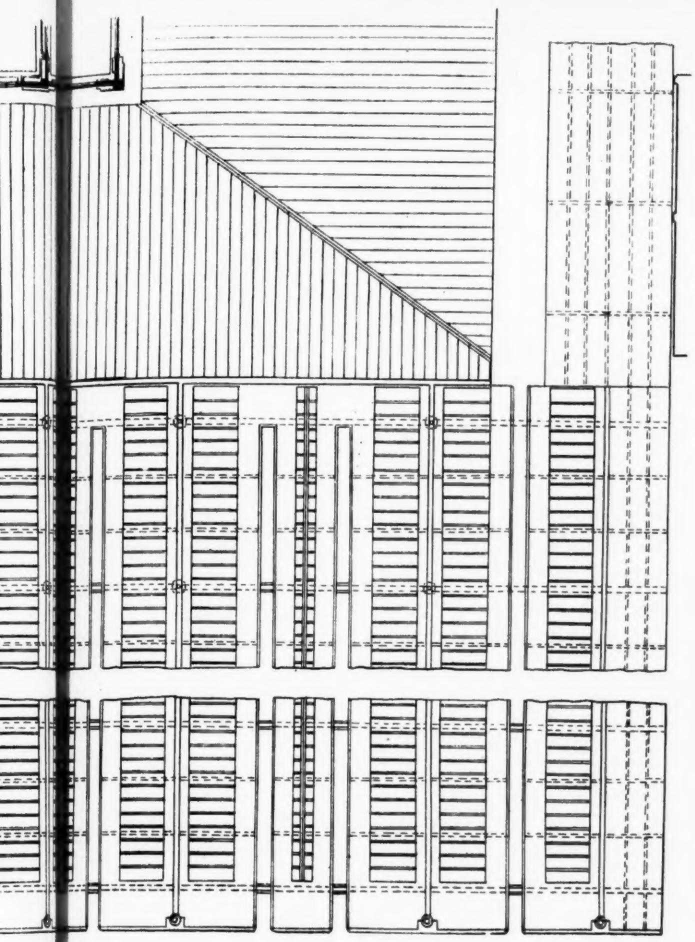


FIG. 3—ELEVATIONS, D., L. & W. TERMINAL AT HOBOKEN

At the eastern end, the train sheds are joined by the roof of the ferry house, and extend to the west for a distance of 607 feet, in post and girder spacings of 27 feet. The width is 338 feet 10½ inches, giving a total covered area by the sheds, of 205,697 square feet. This structure it will be seen is open on three sides, and as far as temperature in winter is concerned, will be as warm as one enclosed but in which heating facilities are absent, as they always are in the open ended type of train shed. There are other departures from the old train shed now under way on several roads, but in none will there be found a more clean cut solution of the question of producing a terminal in keeping with the demands of progressive railroading.



Simultaneous Telephony and Telegraphy on the Northern Pacific Railway

J. C. KELSEY.

THE telephone has become a most important factor in our business and social life. It has completely revolutionized the business methods of the traditional butcher, baker and candle stick maker. It has been generally accepted by the farmer, who from his isolated home can learn the market prices at any moment, and can thereby sell his product at the most advantageous price. The salesmen is in constant touch with the customer, and the buyer in touch with his favorite wholesale house. The department store, with its numerous floors, and numerous patrons, connects the credit man and the salesman by telephone, and by suitable devices, operated over the telephone line, keeps records of the transaction, and saves the time and steps of the customer. It thereby relieves the elevator service, and affords relief beyond description.

Electric railways have demonstrated the usefulness of the telephone for train despatching. Steam roads have not looked with favor on this method on account of the lack of recording features. But there are numerous ways in which the telephone can be used by the railroad, which will relieve the telegraph office of traditional congestion. It is said that one railway system, during a threatened telegraphers' strike, had a provisional order for 3,000 telephones, placed with a prominent telephone manufacturer, so that every telegraph key could be replaced in short notice. The calling off of the threatened strike rather indicated the moral influence of the telephone.

The eastern railways operate their telephone system, in conjunction with the Bell Telephone Co., and have not played a great part in the development of the telephone on a strictly independent basis. It remained for the Northern Pacific system, under Mr. O. C. Green, Superintendent of telegraph service, to originate a strictly independent system of their own, which possesses many unusual features.

The telephone service was first tried between Tacoma and Seattle. So immediate was its success demonstrated that service between Duluth and St. Paul was authorized and completed. A line to Staples and Brainerd from St. Paul followed. Then Staples to Fargo. Also Livingstone to Helena; and Helena to Missoula, and Roslyn to Tacoma.

It will surprise the reader to learn that there are now but three short gaps between St. Paul and Portland. There is a gap between Cow Creek and Spokane, 125 miles in length. This construction has been authorized, and the line will soon be in operation. Another gap lies between Ellensburg and Pasco, also 125 miles in length. There is also a gap between Tacoma and Portland, of forty miles. With these gaps closed, the Northern Pacific railway will be the first concern to give service from the Mississippi to the Pacific.

COMBINING TELEGRAPH AND TELEPHONE.

The beauty and novelty of the Northern Pacific system of communication lies in the combined use of the telephone with the quadruplex telegraph service from the north and west. Figure 1 indicates a telephone line, of metallic nature, between St. Paul and Staples. On this line, there are twenty-three telephones, at the different cities and stations along the railway. Possibly, there are section houses connected to this line at important points. The metallic telephone line, running east and west, is the circuit between Fargo and Staples. There are eighteen telephone stations placed along this stretch. If there is a telephone call from St. Paul to Fargo, the St. Paul operator calls Staples, whose operator connects the Fargo line, and if Fargo wants Duluth, they call Staples, who in turn calls St. Paul, who relays to Duluth.

The quadruplex stations at St. Paul receive their four different mesages over this telephone wire. While Fargo talks to Staples, and another party in Staples talks to St. Paul, there are telegraph messages being sent over this same circuit to Winnipeg, Mandan, and all western points. Truly, a marvelous use of one pair of wires. Forty-one telephone stations, and four separate telegraph communications, over two wires certainly shows efficiency.

The ordinary method of combining telephony and telegraphy is to bridge the telephone line with sufficient

impedance, and to tap the middle point of the coil, for the telegraph service. This would not unbalance the telephone line, nor would it allow the clicking of the telegraph key to be heard on the line. When Mr. Green came to operate his quadruplex circuit, he found that the iron of the bridged coil impeded the quad so seriously as to make it useless. He very boldly cut the iron out of the coils, which allowed the quad currents, so complex in character, to have a non-inductive path, and consequently speeded up the telegraph service. But cutting out the iron is contrary to telephone men's injunctions. But it has been demonstrated that the iron is not necessary, for the forty-three telephones give the best possible transmission, and ringing too, in spite of this non-inductive bridge.

The Figure 1 shows the four quad stations at St. Paul, with the non-inductive bridge on the telephone line, tapped at the middle point. At Staples, the middle point of the bridge is tapped, and the telegraph stations cut in. At Staples, on the Fargo line, the telephone line bridge is tapped at the middle point, and the telegraph service connected. At Fargo, the line is again bridged, the middle point tapped, and one telegraph circuit goes to Winnipeg, and the other westward to Mandan.

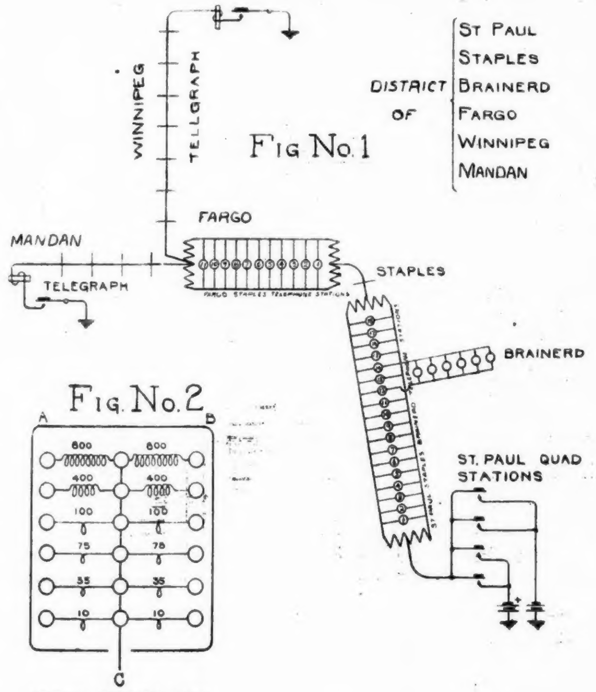
Figure 2, indicates what might be called a telegraph terminal box. There are six pairs of coils, the first being composed of two non-inductive coils of 800 ohms each. These pairs range down to ten ohms each. The terminal point C is connected to one terminal of the telegraph set. The points under A and B are connected to the respective sides of the telephone circuit. If the telegraph service is called for, between St. Paul and Staples, the St. Paul operator connects, for instance, the 800 ohm pair across the telephone line at a convenient place. The Staples operator connects his 800 pair across his end of the telephone line, and the middle point C to the telegraph instrument. If they find 800 ohm coils too high, it is but a short step to the 400, or 100 ohm bridges. There is no interference with the telephone service, and none on the telephone line is aware of the change in the bridge. This clever device is characteristic of the telegraph man, and reveals plainly that he is prepared at all times to give service under the most heartrending conditions.

TELEPHONE WRECKING SETS.

Mr. Green has adopted what may be termed a "Wrecking Set." It is a special telephone set, equipped with a reel and a rod, with a flexible cord, which enables the wrecking crew to have immediate connection with the headquarters of the officials. There are ten crews to be similarly equipped. Eventually, each passenger and freight train may be thus equipped, so that any standing train may have instant communication with any official desired.

There is also a local telephone system, so that each official may have access to the telephone lines. The use of the telephone has lightened the load of the telegraph office, and leaves them more time for important work. The roadmaster may talk to the section man, without

COMBINED TELEPHONE AND TELEGRAPH LINE



GREEN BRIDGE BOX

calling on the telegraph office. The engineer can call the master mechanic without bothering the telegraph office. In other words, the telephone has become indispensable to the railroad interests.

Mr. Green has been interviewed by railroad men from all over the world on his usage of the telephone. All indications point to its general adoption. When telephone conversations between two different pairs of people, or even three or four or five pairs of talkers, and four telegraph messages, take place simultaneously over the same pair of wires, it stands to reason that its use is guaranteed.

All telephone apparatus used on the road has been made exclusively by the Kellogg Switchboard and Supply Co., of Chicago, which company has succeeded in keeping pace with these heavy requirements. That this Kellogg instrument performs so well under such difficult conditions, both in ringing and talking, the railroad officials will cheerfully agree. The Kellogg company has many of the largest railway sytems using its apparatus exclusively. Their wisdom has been lately verified, inasmuch as the Italian government, after most rigid tests, has recently ordered two thousand telephones, for just such difficult work as is required by the Northern Pacific railway.

A New Type of Round House.

THE Atlantic Coast Line Railroad Company has produced something new in round house construction at Waycross, Ga., involving the most simple principles of architecture, yet justifying the expectation of giving ample protection from the elements—which in the "Sunny South" means sun and rain. This round

house is built without walls, being comprised of only a roof supported on posts, and therefore open on all sides.

Wood is the material of which the structure is built throughout, the posts being 12x12 inches, and resting on a solid foundation. The girders are also 12x12 inches and braced by 6x12 inch struts secured to both posts and girders by ¾ inch bolts. Above the girders are 12x12 inch posts in line with those below, and extending to the roof plates which are also 12x12 inches. The purloins are 8x10 inches, and the lower plates 12x12 inches, while the studding which is 2x6 inches, is at the gable ends only. The roof is covered with tile.

There are twelve concrete pits 70 feet long, two of which are assigned to drop pit service. The pits are 31½ inches deep from top of rail to crown of the arch, and are capped with 12x12 inch stringers on which the rails rest. The pits are arranged open under the arched bottom and have a liberal incline to the entering end where the 8-inch terra cotta drain pipes are located. The roof drainage is received in a wooden trough at each eave and disposed of through 4-inch cast iron soil pipes. The smoke jacks are arranged over the pits on the head-in and back-out plan, and over each pit near the apex of the roof is located a clay ventilator 25 inches in diameter.

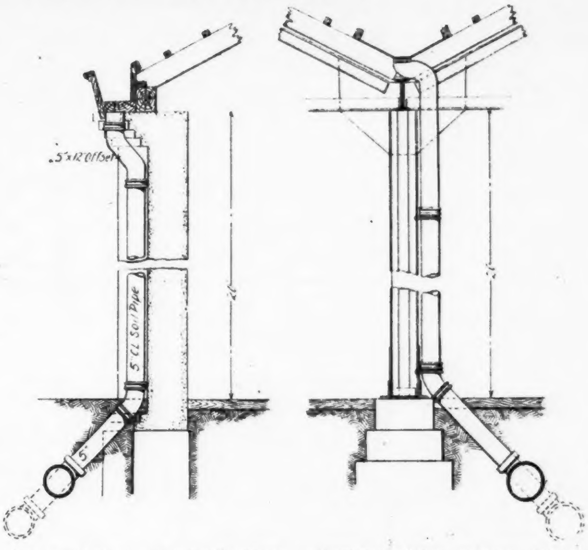


FIG. 1—DETAIL OF DOWN SPOUTS, WAYCROSS ROUND HOUSE, ATLANTIC COAST LINE

In all details necessary to the housing of engines, and taking care of running repairs, this round house is as complete as though surrounded by solid walls, with the important advantage of light and air and low cost of in-

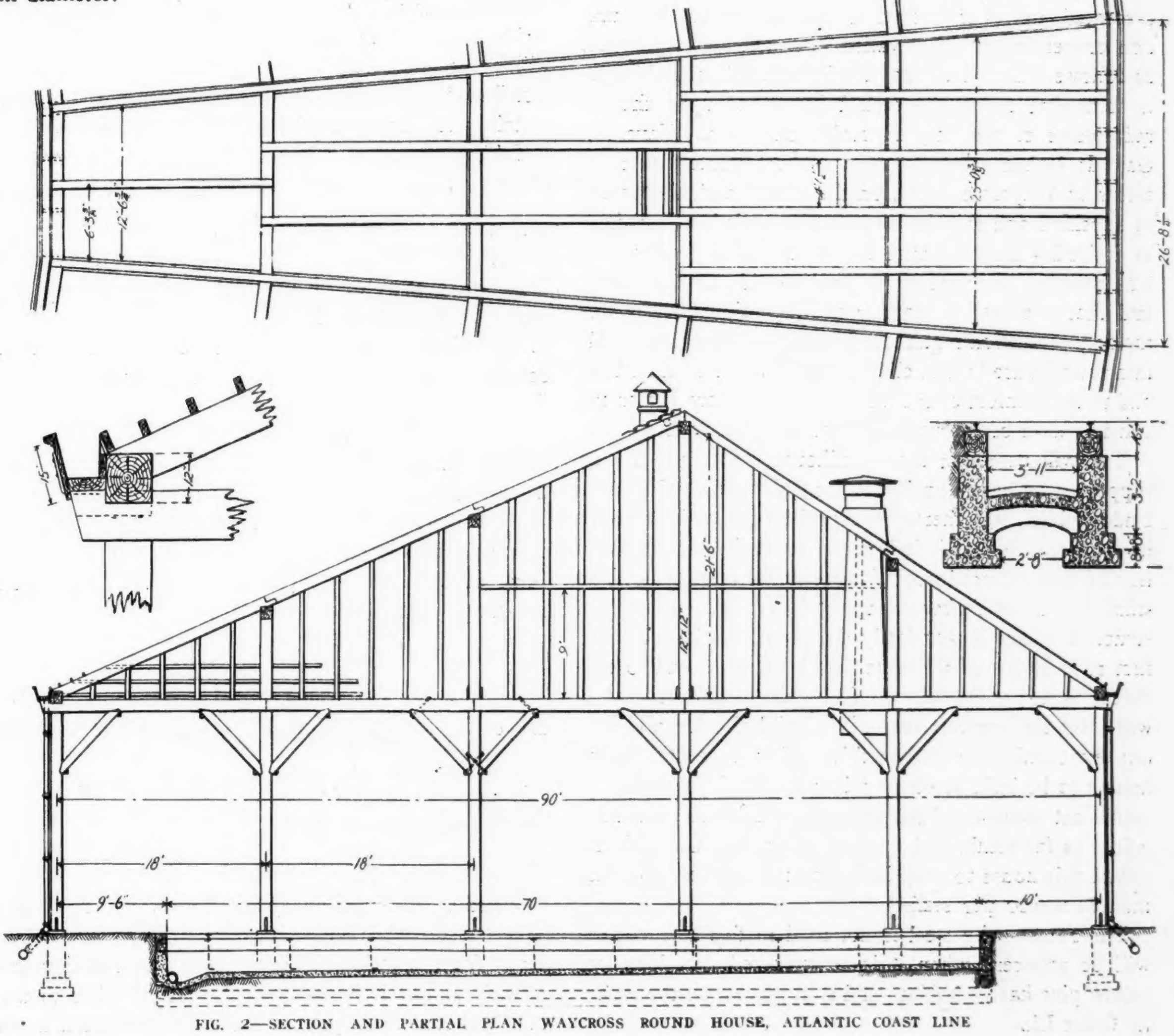


FIG. 2—SECTION AND PARTIAL PLAN WAYCROSS ROUND HOUSE, ATLANTIC COAST LINE

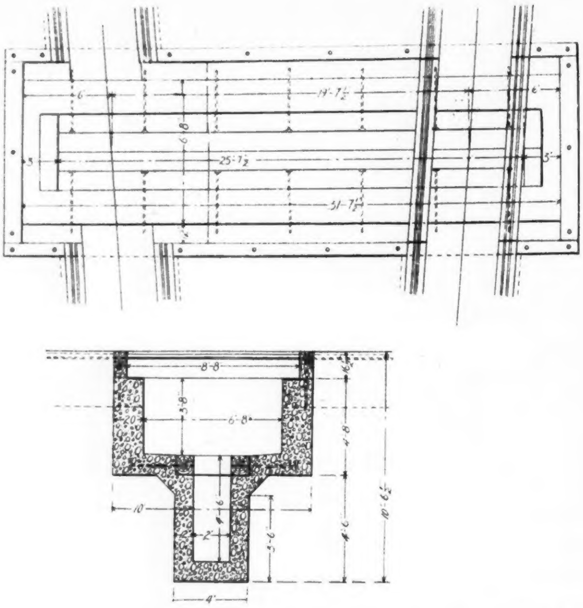


FIG. 3—DROP PIT WAYCROSS ROUND HOUSE, ATLANTIC COAST LINE

stallation. Mr. R. E. Smith, General Superintendent of Motive Power, by whose courtesy these illustrations are presented, writes in answer to our request for information concerning this innovation in round house practice, as follows: "It is true that the idea of this round house is somewhat novel, the plan being based upon the requirements of the very favorable climate at Waycross, Ga. It is but rarely, during a short winter, that ice forms at Waycross, while on the other hand, the period of sunshine and rain is somewhat extended. Therefore. in designing a roundhouse for so favorable a climate, it was thought unnecessary to provide side or end walls, and that overhead protection against rain and sun was the only protection required. In fact we believe that walls in a roundhouse in that climate would detract rather than add to the comfort of the men; then, too, there is also the consideration of the reduced cost of construction.

You will note that the roundhouse is, in fact, a shed supported by heavy uprights that the roof covering is of Ludowici tile, and, therefore, especially adapted for round house work, in that it is immune from the corrosive action of fumes from locomotives standing thereunder. The small amount of timber, excepting large sizes, in this construction makes it practically fire proof. While it is the first roundhouse of this type that I know of, and to that extent is experimental, we feel quite confident that it will meet the requirements of the mild climate, and it is our expectation to follow this design in other engine houses to be built at other points south of Savannah. I would not recommend this style of roundhouse except for points as far south, and south of Waycross, Ga. We estimate this house to cost, including the concrete pits, less than $1,000.00 per stall.

The reason why steel is not used in this construction will be apparent when it is remembered that long-leaf yellow pine has its habitat, and is at its best on the Atlantic Coast Line.

Moments Due to Moving Loads.

THERE are many problems, says Indian Engineering, including some of those with which the engineer is most frequently confronted, that find no place in the average text-book: being omitted on the highly reasonable ground that they are deducible by simple mathematical process from those elementary principles which the treatise proposes to have already expounded with sufficient fullness.

Complexity in detail may, however. actually bring as much of difficulty as was ever due to abstruse principle or theory; and some few problems of this nature if not attacked until presented as casual portion of some one day's work will—and indeed must be scamped or neglected altogether. Among such may be mentioned the calculation of the maximum bending moment in a small girder under a group of moving loads: an elementary but interesting problem, which forms the subject of an unpretentious but valuable note by Mr. E. H. Young, which may be found among the selected papers of the London Institution.

In designing a large span girder, ample time will be necessary and must ungrudgingly be given to the elucidation of this and all similar points under the particular circumstances of the case but in the much more frequent incident of call to design small girders and beams in which the fixed load may be fairly taken as uniformly distributed, such questions as that here mentioned ought certainly to have met with previous consideration.

Taking, then, our origin at one end of the beam and writing x, $x+a$, $x+b$, $x+c$, and $\frac{l}{2}$ for the abscissæ of the foremost load, of a fixed point, of the center of gravity W the sum of all the moving loads of the center of gravity of P the sum of those moving loads which lie beyond the fixed point, and of G the weight of the girder;—we find for the position in which the bending moment is a maximum the equation

$$X=\frac{l}{2}-\frac{Wb}{2W+C}-\frac{(W+G)a}{2W+6}\ldots\ldots\ldots(1)$$

Now for any given value of P—that is to say when we suppose our "fixed point," or section whose moment we consider, to lie between two specified consecutive moving loads—there may or may not be a maximum value of the bending moment. If there is, we obtain the simple equation

$$a=b+\frac{(W-2P)\,(2W+G)}{2W^2}l\ldots\ldots\ldots(2)$$

Substituting this value in (1) we obtain for $x+a$ the expression $\frac{W-P}{W}l$; and for $x+b$ the expression

$$\left\{\frac{P(W+G)}{W^2}-\frac{G}{2W}\right\}l.$$ Whence for the maximum.

bending moment we obtain

$$\left\{\frac{l\,(2W+G)}{2W}+b-c\right\}P-\frac{l\,(2W+G)}{2W^2}P^2$$

Whether the maximum lies within the interval we have considered is shown at once by the value obtained for *a* from equation (2), and since this equation is extremely simple it is easy in a couple of trials to ascertain between which pair of loads the maximum actually

lies. Of course, if the error in our assumed position of the section at *a* changes direction as we move from one moving load "bay" to another, it indicates that our section of maximum bending moment lies immediately beneath the dividing load: and, equally of course, if the value obtained for x throws any of our moving loads off the span we must strike those loads out of consideration and recalculate our values.

The Steel Tie.

ONE of the problems of most serious import to maintenance-of-way officers ever since rails carried traffic, has been that of tie renewals. Wood has always been the chosen material for the purpose, for two reasons, first, on account of low first cost, and second, because of its peculiar fitness for the work, by reason of its elasticity. The life of a tie is by the very nature of the material a misunderstood and widely variable quantity, even when thoroughly seasoned—which it never is, and when laid in soil most favorable to its preservation; the two conditions which give it the longest period of service, which on the average is not more than five to seven years when deterioration is due to natural causes alone, and it is plain that its life is not lengthened by the destructive effects of road impact which destroys the fibre under the rail as weil as on the side next the ballast.

The enormous amount of material required for renewals has furnished the incentive to some large roads to enter the domain of forestry with the view of growing the timber, at least in part, to supply future needs. Developments to date point to unsatisfactory results in this direction, not only for want of sufficient area under cultivation, but also by reason of the time necessary to produce the required growth. It is well understood that scarcity alone of material for ties, is not the only consideration—timber is available, but the first cost, while comparatively low, is an item in maintenance that is appalling when taken in the aggregate, and this is what has caused activity in the attempt to produce a tie of longer life than wood, at a price within the resources of railway companies. The result of this situation is shown in the concrete and steel ties that have been tried in the last few years.

Of the first named tie, limited experience with it has shown that it lacks the prime element of elasticity, reenforced or not, through which cause may be traced its failure to give anything but an evanescent service. The same cause has operated to keep steel ties out of the running, since rigidity is the one thing that operates to destroy both the tie and the rail, and though the price of the steel tie were made low enought to compete with wood, if the design is such as preserve the inherent rigidity of the metal it is barred from adoption. This is the verdict of practical as well as technical men who have given the subject of ties careful attention, and these conclusions have been reached, not alone by a labored study of stresses under load, but rather by observations which have been corroborated by the mathematics of the question. That the steel tie will be designed to cover all conditions of service and at a cost that will make its use universal, is the opinion of some of the best minds engaged in track maintenance.

Effect of Snow on Third Rail.

DURING the snow storm of Feb. 9, the New York Central had an opportunity to test one of their electric locomotives under conditions of the most adverse character in the effect of snov .n the machine and the third rail. The snow was. of exceptional severity, leaving an average of ov r 16 inches on the level, with 5 inches on the third rail, and this was aggravated by the deposit of the plow of the locomotive, which would throw more than enough snow to cover the rail, and it was quickly seen that the action of the plow was not conducive to good work, especially on the top contact open rail.

The locomotive itself did not suffer from the snow bucking experience, which occupied the entire day, there being only a slight connection about the commutator and brush holder, and practicaly none on the armature, while there was no difficulty whatever with the motor, from snow, the engine performing in all respects the same as a steam machine under like circumstances. It was on the third rail, however, that interest centered, for the plow, as stated, caused the snow to bank, and curiously enough the exposed rail was found to clear more easily than those having protective devices which tended to catch and hold the snow.

In the case of the top contact uncovered rail, the snow became ice after the first application of the shoe, leaving a coating on the rail that was practically prohibitive to traffic in service, and it was also demonstrated that the same type of contact rail when protected was in some instances of far less efficiency than when left uncovered. The under contact rail, however, gave different results in that the snow tended to drop from the under side of the rail and not form ice, becoming cleaner with each succeeding application of the shoe to the rail, and giving no trouble.

This showing will leave its impress, no doubt, on third rail design and application, since it demonstrates very clearly that in addition to its efficiency against the deadly effects of snow and ice, which was a sealed book before these tests, the design safeguards human life. Another lesson, standing out so prominently as to force attention, is the need of a snow plow that fits the conditions of third rail service, and that will deposit snow away from the current conductor. A one-side plow of proper design would appear to be a solution of the question.

Personals.

Mr. H. E. Martin has been appointed superintendent of buildings of the Denver, Enid & Gulf, with headquarters at Enid, Okla.

Mr. T. F. Reilly has resigned as general roadmaster of the Chicago, Cincinnati & Louisville at Peru, Ind.

Professor W. D. Taylor has been appointed chief

engineer of the Chicago & Alton, effective on February 1, to succeed Mr. G. H. Kimball.

Mr. A. W. Grosvenor has been appointed assistant engineer of the Western division of the Pennsylvania Company, with office at Fort Wayne, Ind., in place of W. R. Hillary, transferred.

The title of Mr. E. E. Hart, engineer of the New York, Chicago & St. Louis, has been changed to chief engineer, his duties remaining as heretofore. Headquarters, Cleveland, O.

Mr. Francis Boardman has been appointed division engineer of the Electric division of the New York Central & Hudson River, with headquarters at New York.

Mr. Leonard Cox has been appointed chief engineer of the Louisville, Henderson & St. Louis, with headquarters at Louisville, Ky., succeeding Mr. R. N. Hudson, resigned.

Mr. George Wilmuth has been appointed division roadmaster of the Chicago, Rock Island & Pacific at Chickasha, I. T., in place of C. A. Booher, deceased.

Mr. J. F. Carey has been appointed chief engineer of the Denver, Enid & Gulf, with headquarters at Enid, Okla., to succeed Mr. J. B. Dalton, resigned.

Mr. F. A. Molitor has been appointed supervising railway expert for the Philippine government in charge of the construction of over 1,200 miles of new railroad in the Philippine Islands.

Mr. Theodore H. Bacon, heretofore assistant engineer of the Chicago & Great Western at Saint Paul, Minn., has been appointed assistant chief engineer, with headquarters at Saint Paul, Minn.

Mr. George W. Bradshaw has been appointed assistant supervisor of signals of the Middle division of the Pennsylvania at Altoona, Pa., in place of Mr. W. N. Spangler, transferred.

Mr. John Merry has been appointed roadmaster of the Minot division of the Great Northern at Minot, N. D., vice Mr. C. T. Nolan, transferred.

Mr. J. K. Stroufe has been appointed engineer of maintenance of way of the Chicago, Cincinnati & Louisville, with office at Cincinnati, O.

Mr. P. S. Mitchell has been appointed supervisor of the Pennsylvania at Reading, Pa., succeeding Mr. S. E. Holland, who has been transferred to Barnesboro, Pa., in place of Mr. Mitchell.

Mr. E. H. Barnes, resident engineer of the Grand Rapids & Indiana, has been appointed chief engineer of that road, with office at Grand Rapids, Mich.

Professor W. D. Taylor, professor of railway economics at the University of Wisconsin, has been appointed chief engineer of the Chicago & Alton, with headquarters at Chicago, effective on February 1, to succeed Mr. G. H. Kimball, who recently resigned.

Mr. E. B. Fithian, assistant division engineer of the Baltimore & Ohio at Cleveland, O., has been appointed division engineer of maintenance of way of the Ohio River division at Parkersburg, W. Va., succeeding Mr. R. R. Lukens, resigned.

Mr. H. E. Warrington, heretofore assistant engineer of the Cincinnati, New Orleans & Texas Pacific, has been appointed principal assistant engineer of that road and the Alabama Great Southern, with office at Cincinnati. O,

Mr. F. G. Jonah has been appointed terminal engineer of the New Orleans Terminal Company, with office at New Orleans, La., to succeed Mr. C. H. Fisk, resigned, to accept service with another company.

Mr. W. F. Steffens has been appointed engineer of bridges and buildings of the South & Western Railway, Lick Creek & Lake Erie Railroad and the Carolina Company, with office at Bristol, Va.-Tenn.

Mr. Colin M. Ingersoll, Jr., commissioner of real estate, right of way and taxes of the New York, New Haven & Hartford and formerly chief engineer of that road, has been appointed chief engineer of the department of bridges of New York City.

Mr. C. G. Vaughn has been appointed construction engineer in charge of the extension of the Morgan's Louisiana & Texas from Lafayette to Baton Rouge, La., with headquarters at 511 Natchez street, New Orleans, La. Mr. J. F. Coleman, Hibernia building, New Orleans, is consulting engineer for the work.

Mr. William T. Hanley has been appointed supervisor of the Pennsylvania Railroad at Dravosburg, Pa., vice Mr. G. R. Sinnickson, transferred. Mr. E. L. Watson has been appointed supervisor of signals of the Philadelphia division, in place of Mr. W. P. Allen, promoted.

Mr. O. C. Le Suer, division engineer of the Pere Marquette at Saint Thomas, Ont., has been transferred to Detroit, Mich., in a similar capacity. Mr. W. J. Long has been appointed division engineer at Grand Rapids, Mich., in place of Mr. W. J. Deimling, promoted.

Mr. J. F. Deimling, heretofore division engineer maintenance of way of the Pere Marquette at Grand Rapids, Mich., has been appointed chief engineer, with headquarters at Detroit, Mich Mr. J. Tuthill has been appointed engineer of bridges and buildings, with office at Detroit, Mich. Mr. Tuthill heretofore has been engineer of bridges. Effective on February 1.

It is announced that Mr. A. C. Shand, assistant chief engineer of the Pennsylvania Railroad, will succeed Mr.. W. H. Brown as chief engineer of that system on March 1, when the latter will have reached the age of 70 years and will retire under the provisions of the pension plan of the company. Mr. Brown was born on February 29, 1836, and has been in the service of the Pennsylvania System for 45 years. He has held the position of chief engineer since June 1, 1881.

Mr. M. C. Byers, formerly engineer of maintenance of way of the St. Louis & San Francisco, and who in June, 1905, was assigned to special work in connection with maintenance of way, has been appointed assistant to the general manager, with headquarters at Saint Louis. He

will have full charge of improvement work on the system, inspection of maintenance of way material and such other duties as may be assigned to him. Mr. M. O'Dowd has been appointed chief tie and timber inspector, with office at Springfield, Mo. Effective on February 1.

Mr. H. M. Cryder has resigned as principal assistant engineer of the Wabash to accept the position of manager of the firm of William P. Carmichael & Co., engineers and contractors, in charge of the Western district, with office in the Fullerton building, Saint Louis, Mo. Mr. E. K. Woodward, heretofore engineer of maintenance of way of the Wabash at Peru, Ind., has been appointed principal assistant engineer, with headquarters at Saint Louis, to succeed Mr. Cryder, and Mr. W. S. Danes, master carpenter at Peru, has been appointed engineer of maintenance of way at that point, in place of Mr. Woodward.

The following appointments are announced on the Tidewater and Deepwater Railways by Chief Engineer Fernstrom: Mr. Philip Aylett is appointed resident engineer in charge of Elizabeth River bridges and Southern Branch terminals, with office at Southern Branch, Va.; Mr. B. T. Elmore is appointed assistant chief engineer, with office at Norfolk, Va.; Mr. F. F. Harrington has been appointed bridge engineer, with office at Norfolk, Va.; Mr. C. H. Stengel is appointed designing engineer, with office at Norfolk, Va. The following principal assistant engineers are appointed: Mr. L. R. Taylor, of the Tidewater Railway, Eastern district, from Sewall's Point to Mile Post 206, with office at Norfolk, Va.; Mr. E. Gray, Jr., of the Tidewater Railway, Middle District, Mile Post 206 to the west line of the state of Virginia, with office at Roanoke, Va.; Mr. W. P. Taft of the Deepwater Railway, now under construction, with office at Princeton, W. Va. The following division engineers are appointed: Mr. A. L. Cornell of the First division, from Sewall's Point to Mile Post 103, exclusive of the terminals at Sewall's Point, Norfolk and Southern branch, and the Elizabeth River bridges, with office at Norfolk, Va.; Mr. P. B. Houston of the Second division, from Mile Post 103 to Mile Post 155, with office at Keysville, Va.; Mr. F. A. Jones of the Third division, from Mile Post 155 to Mile Post 206, with office at Brookneal, Va.; Mr. W. C. Knowlton of the Fourth division, from Mile Post 206 to Mile Post 253, with office at Roanoke, Va.; Mr. W. P. Stalnaker of the Fifth division, from Mile Post 253 to Mile Post 293, with office at Christiansburg, Va.; Mr. D. B. Dunn of the Sixth division, from Mile Post 293 to Mile Post 332 (Virgina-West Virginia state line), with office at Eggleston, Va.; Mr. D. W. Crane of the Seventh division, from Mile Post 332 to Mile Post 362, including Princeton terminals, with office at Oakvale, W. Va.; Mr. A. D. Exall of the Eighth division, from Mile Post 362 to Mile Post 405, with office at Matoaka, W. Va.

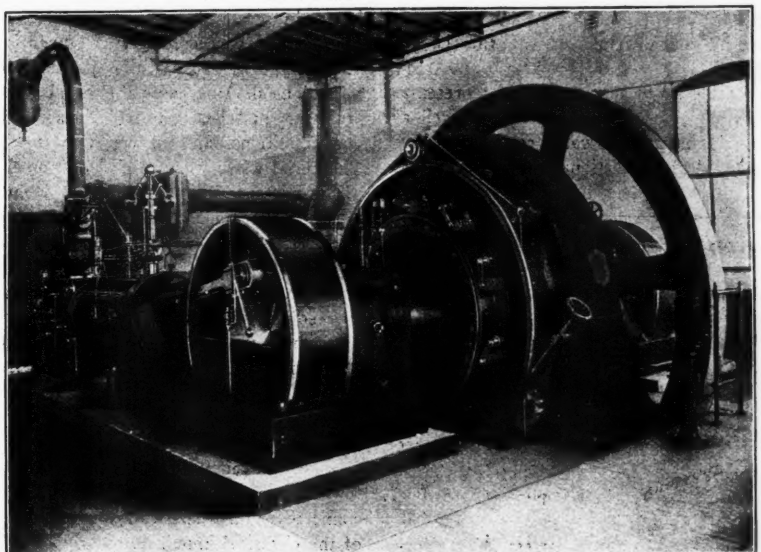
Another Interurban Railway for Northern Indiana

The State of Indiana, especially the northern portion, is fast becoming an important center for a network of Interurban Trolley Lines which have been and are being built, interconnecting the towns along the Wabash Valley. The Winona Interurban Railway Company, Winona Lake, Ind., is the latest project of the kind to be undertaken.

The Winona Interurban Company is being promoted and will be controlled by the Winona Assembly, a Presbyterian organization in the nature of a "Chautauqua" center for Presbyterians and others of that section.

The proposed line will run form Warsaw to Goshen, Ind., about twenty-seven miles, for which the right of way has been acquired and the grading for the entire line completed. The line is located in a portion of two counties which, by action already taken by popular vote, are now collecting taxes appropriate for a subsidy.

The Allis-Chalmers Company of Milwaukee will furnish the electrical equipment for the proposed line, including equipments,



700 H. P. HEAVY DUTY CROSS COMPOUND ALLIS-CHALMERS ENGINE, DIRECT CONNECTED TO A BULLOCK GENERATOR IN PLANT OF THE CEDAR RAPIDS & MARION STREET RY. CO.

power house and machinery, through the Electrical Installation Company of Chicago, in charge of the actual construction and installation.

The Winona Assembly Organization is understood to have expended over three million dollars on grounds and buildings, to which additions are constantly being made. The permanent population at Winona Lake is about twelve hundred, while the transient population during the past summer, amounted to over three hundred thousand visitors.

It is expected that the line will be in operation by April.

The equipment specified will consist of two Allis-Chalmers cross compound condensing engines to drive two 600 K. W. Allis-Chalmers alternators, 25 cycle, six quadruple 75 H. P. motor equipments, one 300 K. W. alternator, three 300 K. W. rotary converters with transformers, reactance coils, etc., and the usual auxiliary apparatus for sub-station equipment.

In Honor of George H. Daniels

In the presence of five-hundred warm friends in the advertising fields, and also prominent business men who had gathered to do him honor at the Waldorf-Astoria on the night of February 20, Mr. Geo. H. Daniels, the general advertising agent of the Vanderbilt lines, arose to receive a welcome that, as put by one of the speakers, "represented the feelings of a lot of good fellows toward the prince of good fellows." Notwithstanding this was the first public function attended by Mr. Daniels since his serious illness he evinced his old form when he spoke in part as follows on his pet theme:

"The railroad business is the most honest business in the world. Take the drug business. You go into a drug store and ask for a medicine you have used for years, and in nine cases out of ten the druggist offers you something "just as good." You go to the Grand Central Station tonight and ask for a ticket to Springfield, and I'll wager you the ticket agent won't try to sell you a ticket to Cleveland.

"The underlying secret of success in every field is advertising—except in the business of stealing and burglary. The great railroads are putting large sums of money in advertising every year. Advertising is the advance agent of foreign commerce, and but for that fact we would not stand anywhere as a nation among other nations today. But in advertising you have got to have something to sell, and you have got to tell the truth, for you can't deceive any great number of people for any great length of time. Among the brightest men in this field must be mentioned the advertising agents. The man in business without advertising, is in business without a foundation. The railroads are the advance agents of the development of the United States."

The occasion was memorable by the attendance of representatives from the army, navy, judiciary and the clergy, as well as the solid business men of Manhattan. It was a compliment that would warm the cockles of a less impressionable heart than that of Geo. H. Daniels.

Railway Association and Club Meetings for March

American Railway Engineering and Maintenance of Way Association, Auditorium Hotel, Chicago, March 20, 21, 22.

Canadian Railway Club, Windsor Hotel, Montreal, Que., March 6.

Car Foreman's Club of Chicago, 26 Van Buren street, Chicago, March 13.

Central Railway Club, Hotel Iroquois, Buffalo, N. Y., March 9.

Iowa Railway Club, March 19.

New England Railroad Club, Pierce Hall, Copley Square, Boston, March 13.

New York Railroad Club, 154 West 57th street, New York, March 16.

North-West Railway Club, West Hotel, Minneapolis, March 13.

St. Louis Railway Club, Southern Hotel, St. Louis, March 9.

Railway Club of Pittsburg, Monongahela House, Pittsburg, March 23.

Richmond Railroad Club, Richmond, Va., March 8.

Pacific Coast Railway Club, San Francisco, Cal., March 17.

Western Railway Club, Auditorium Hotel, Chicago, March 20.

Notes of the Month.

Mr. Sheldon E. Bent is connected with the Railway Appliances Company in the Track Department. He is a Railroad man of considerable acquaintance, having been located in Mexico the last six or seven years as Superintendent of Transportation of the Oceanic of Mexico and as General Superintendent of the Vera Cruz & Pacific. Previous to that he was at one time Superintendent and then Purchasing Agent of what is now a part of the Brooklyn Rapid Transit Co.

Consul McNally, of Liege, reports that an order for 8,000 tons of steel rails, with a considerable tonnage of accessories, was recently booked for delivery at Buenos Aires. An order for 100,000 steel sleepers has been on the market for some time and efforts have been made by the local manufacturers to obtain it. Whether the price or some other condition interfered, it is said that the order is now to go to a German maker who specializes on this particular work.

Consul-General Winslow, of Guatemala City, reports that Mr. Minor C. Keith, one of the promoters of the Guatemala Railway, and Mr. Percival Farquhar, general manager, of New York, have been in Guatemala looking over the work, and while here informed me that the road would be completed from Puerto Barrios to Guatemala City by the end of 1906. This will mean much for American exporters, and our people ought to take advantage of it, for it will bring Chicago, St. Louis, and New York in as close touch with this Republic as they are with California, Oregon and Washington, and I am informed that freight rates are to be very satisfactory. The same interests that control this railway control the United Fruit Company, of New Orleans and Boston, and it is proposed, when this railroad is completed, to put on a direct line of steamers from Puerto Barrios to New Orleans that will make the voyage in less than three days.

Consul Daniels, of Sheffield, reports that, by license of the postmaster-general, the Midland Railway Company is conducting a series of experiments in the vicinity of Derby to determine whether wireless telegraphy can be used in connection with their fast-train service between London and the north. The system adopted was conceived by Sir Oliver Lodge and Dr. Alexander Muirhead, who are assisting the electrical engineer of the railway. The difficulty with the aerial wire constituted the greatest problem. In order to test the idea under the most disadvantageous conditions, an old car was used as a receiving station. The aerial wires were carried on porcelain insulators, the height of the wires varying from 9 to 15 inches above the curvature of the roof. It is claimed that never before has so short an aerial wire been used in wireless telegraphy. From the roof the wires are carried in a small cable through a special insulated fitting to the interior of the van to the receiving instrument. Here the succeeding waves of dots and dashes are separated and resolved into words upon a drum of paper similar to those employed in a tape machine, the message being written by a Lodge-Muirhead syphon recorder such as is used with marine cable instruments. The transmitting station is situated in a hut near Derby, with an installation of apparatus for sending the message into the air. Outside the cabin is the aerial wire, which follows conventional lines, being supported upon masts 40 feet from the ground and connected with a spark gap and coil for increasing the strength of the electrical impulse discharged from the transmitting instruments at the station. The experimenters find the common trouble of enormous electrical energy being required to obtain successful conversation, especially to compensate for the short aerial wire used at the receiving station.